REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
30/04/2018	Presentation	04/30/2018-05/03/2018

4. TITLE AND SUBTITLE
Disasters & Impact of Sleep Quality & Quantity on National Guard Medical Personnel

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Rowan, Stephanie D, Lt Col

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
59th Clinical Research Division
1100 Willford Hall Loop, Bldg 4430
JBSA-Lackland, TX 78236-9908
210-292-7141

8. PERFORMING ORGANIZATION REPORT NUMBER
17801

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
59th Clinical Research Division
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JBSA-Lackland, TX 78236-9908
210-292-7141

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release. Distribution is unlimited.

13. SUPPLEMENTARY NOTES
TriService Nursing Research (TSNRP) Dissemination course, San Antonio, TX, 30 April - 3 May 2018

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Clarice Longoria
					19b. TELEPHONE NUMBER *(Include area code)* 210-292-7141

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Disasters & Impact of Sleep Quality & Quantity on National Guard Medical Personnel

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The voluntary, fully informed consent of the subjects used in this research was obtained by 32 CFR 219 and DODI 3216.02_AFI40-402

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Sleep-The HOT Topic

Navy Seeks Better Sleep For Crews With New Rest Guidelines, Special Glasses

By: Ben Werner
December 28, 2017 4:39 PM

Gunner's Mate 2nd Class Fredericksen Coulter stands the optical sight systems watch in the combat information center aboard the Arleigh Burke-class guided-missile destroyer USS Oscar Austin (DDG-79). US Navy photo

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Headlines from Army News Releases (October -December 2017)

Sleep deprivation countermeasures

Even with good habits, I still cannot sleep

Managing sleep & shift work

AARP Bulletin

Can't Sleep? Join the crowd:

1/3 of Americans over 65 have trouble reaching the land of nod

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Learning Objectives

- Participants will be able to compare methods of data collection for sleep studies.
- Participants will be able to discuss sleep research and the resulting implications for measuring operational performance.
- Participants will be able to recommend three strategies for nurse leaders and commanders for improving sleep hygiene.

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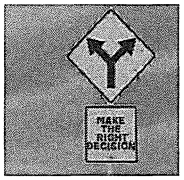
Problem

- Sleep research
  - National guard personnel (more specifically, medical personnel) generally have civilian employment with potential for variable work shifts. Weekend UTA requirements are 0700-1600; but disaster response training can be 24/7 or at minimum of 12-18+ hour requirements. Very little transition time when responding to real-world disasters.
  - Measuring sleep, sleepiness and decision-making in the field
  - Limiting disruption of military training mission
  - Selecting appropriate critical skills assessment modality



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Overview of Sleep Study Research with Air National Guard Medical Personnel

Disaster response mission

Goal: to evaluate, describe sleep health of medical personnel who have civilian jobs and perform military roles in National Guard.

Overview of sleep study

- Pilot study of critical skills and proxies (BSN and DNP students) for military medics and medical personnel (RNs, PAs, NPs, MDs, Pharmacists, CRNAs)
- Recruitment from base 1
- Completion of Rand self-reported sleep survey
- Wearing of Readiband to record actigraphy data
- Sending critical skills questions and KSS (sleepiness) question 4 times/day
- Recruitment from base 2
- Repeated measures

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Background

- Sleep is critically important for human functioning
- Chronic sleep loss can cause long-term health problems
- Acute sleep loss impairs cognitive performance (errors, accidents etc.)
- National Guard medical personnel are required to respond to disasters that could severely restrict their sleep
- A better understanding of the extent and nature of sleep restriction during disaster preparedness exercises will guide interventions that protect our service members and civilians

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Lessons from Sleep Science

- Sleep is a fundamental and basic human need
- Sleep loss interferes with our ability to deal with complex, stressful situations
- Fatigue impairs cognitive functioning, narrows perception, increases hostility, and elevates anxiety
- Medical errors are currently the third l cause of death in the US
- Fatigue contributes to 70% of errors
- Interventions are critical

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Purpose

Aim 1: Estimate the extent of sleep restriction, deprivation, and fragmentation on National Guard members participating in disaster training.

Aim 2: Assess the impact of sleep restriction, deprivation and fragmentation on operational performance during disaster training.

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Method

Design: Longitudinal repeated measures design

Participants: N=77 (two Air Force/ANG Bases)

Procedure: Wrist actigraphy was used to objectively monitor sleep:

1. ~7-day baseline period (civilian)
2. 2-day transition period
3. 5-day disaster training period

Materials: Readiband v3 by Fatigue Science

Analysis: Differences in sleep over time were analyzed using generalized linear mixed (GLM) models

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Methods

Measures:

- RAND Self-report survey (demographics, military history)
- Sleep health
  - Actigraphy (civilian, transition, during)
  - Self-reported Karolinska Sleepiness Scale (KSS)
    How sleepy do you feel right now?
    1=extremely alert to 9=extremely sleepy

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Methods

- Measures
  - Critical skills questions
    - Medication calculations ➔Licensed
    - Basic Life Support (BLS) ➔Non-licensed
  - Different question sent four times a day
    - 08:00, 12:00, 16:00, 20:00
  - Qualtrics Survey Research Suite ™
    - Sent link via text message

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Methods

Analysis:

Associations between sleep health, fatigue and demographics with performance were analyzed using generalized linear mixed modeling (multi-level modeling)

- Random intercept model
- Unstructured covariance matrix
- Interactions specified

Accuracy: all observations included

Normed response time: correct responses only

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Descriptive Data Results

Description of each exercise time period

- Exercise 1: Base 1 only: extended military weekend, cadaver training, skills training, work with local response personnel
- Exercise 2: Both bases preparing for Exercise Evaluation (EXEVAL) of readiness by evaluators, so both bases conducted a small training exercise
- Exercise 3: Actual EXEVAL 5 days-convoys to site of training; early morning report time for medical personnel to conduct pre-assessments on ALL personnel (upwards of 250-500 personnel from Air and Army National Guard)
- Comparisons of demographics for two military National Guard units

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Participant Demographics

Characteristic	Base 1 (n=37)	Base 2 (n=40)
	M (SD)	M (SD)
Age (years)	36.0 (9.1)	35.6 (9.2)
Sex:	n (%)	n (%)
Female	13 (35.1%)	18 (45.0%)
Male	24 (64.9%)	22 (55.0%)

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Participant Military History

Characteristic	Base 1 (n=37) n (%)	Base 2 (n=40) n (%)
Number of OCONUS deployment:		
Never deployed	17 (46.0%)	16 (40.0%)
1 – 3	17 (46.0%)	18 (45.0%)
4 – 7	2 (5.4%)	5 (12.5%)
8 or more	1 (2.7%)	1 (2.5%)
Months home since recent deployment:		
6 months or less	1 (5.0%)	0 (0.0%)
12 – 18 months	0 (0.0%)	1 (4.2%)
More than 18 months	19 (95.0%)	23 (95.8%)

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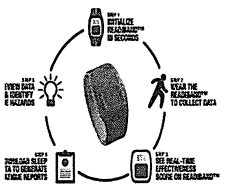
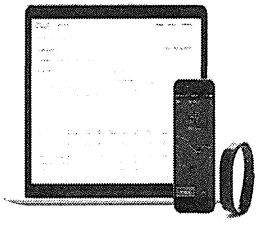
Wrist Actigraphy

- Non-invasive and objective measure of sleep
- 92% accurate compared to polysomnography
- Readiband by Fatigue Science is FDA approved
- Algorithms calculate sleep quantity, quality, and "cognitive effectiveness" (calculated based on prior sleep, time since last sleep, and time of day)





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Results

- Participants averaged 7.16 hours of sleep per 24h period during the baseline measurement period
- Average baseline sleep quality was 85% and their cognitive effectiveness score was 91%
- During the disaster exercise period, participants' sleep duration dropped significantly to 5.9 hours (F=39.22 (1,74); p=<0.0001)
- During the disaster exercise period, cognitive effectiveness also dropped significantly to 87% (F=19.61 (1,58); p<0.0001)
- Sleep quality did not vary significantly across measurement periods

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Results

Table 1: Participant Response to Critical Skills Questions

Disaster-Training Exercise	No. of Skills Questions Answered	
	Percentage	Median (IQR)
Ex 1: 4 Days; n=24 participants; 16 skills questions		
Base 1	55%	9.5 (5-13)
Ex 2: 3 Days; n=52 participants; 12 skills questions		
Base 1 and Base 2	37%	4 (3- 6)
Ex 3: 5 Days; n=61 Participants; 20 skills questions		
Base 1 and Base 2	34%	6 (3-10)

IQR=Interquartile range

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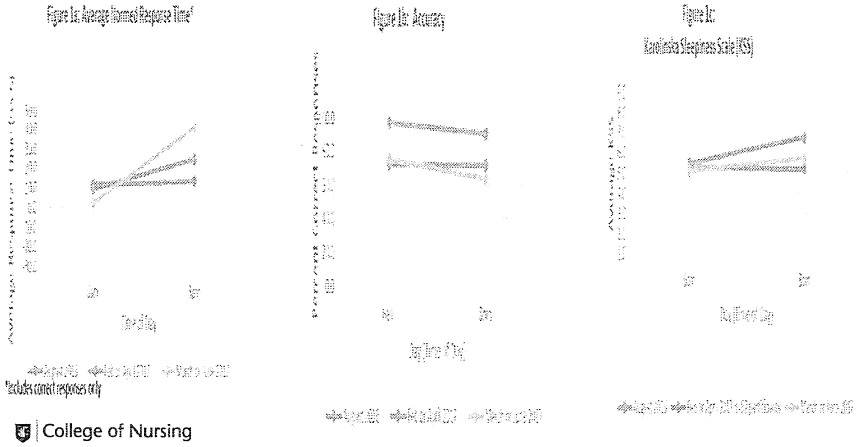
RESULTS and TRENDS



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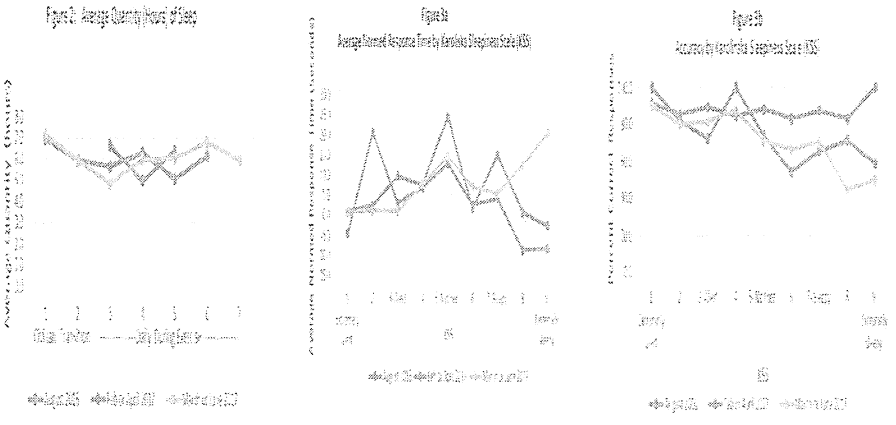
RESULTS



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Results: GLMM Regression Analysis

Pooled Across Exercises (n=70 participants; 858 skills)

- KSS associated with lower accuracy
  - F(df1,df2)=23.68 (1,856); p<0.001
- Licensure associated with higher accuracy
  - F(df1,df2)=19.25 (1,57); p<0.001
- Increasing age associated with higher accuracy
  - F(df1,df2)=5.50 (1,54); p=0.02
- Base 2 associated with higher accuracy
  - F(df1,df2)=6.26 (1,64); p=0.01

No significant associations with response time

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Challenges

- Conducting research in a military field setting during actual exercises
  - very fluid environment
- Identification of a non-disruptive way to measure operation performance
- Cell service can be unreliable
- Consider measuring activity level

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Implications

- For researchers:
  - Coordination of data collection under field conditions
  - Need for flexibility or alternate plans for data collection that is dependent on WiFi connections.
- For participants:
  - Practice good sleep hygiene before & during training and real-world disaster responses.
  - For real world responses, safety is primary focus for service member as well as patients/victims.
- For military commanders:
  - Consider rest & down time environments (noise, comfort)
  - Plan for longer rest/sleep periods
- For military nurses:
  - Sleep hygiene briefings 2-3 months and immediately before training & real-world responses
  - Assessing environment with recommendations to commanders if trends noted in field.
  - Encourage service members who work night shifts in their civilian jobs to coordinate schedules with employers for time off to acclimate before planned disaster training exercises.

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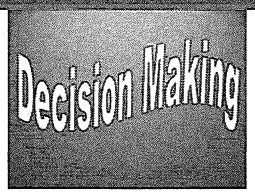
Implications



- Making medical decisions during mass casualty events, disaster events, & in field settings can be impacted by sleep quality & quantity.
- Finding the best tool to measure critical skills is an on-going challenge
  - Must be skill specific
  - Must be valid & reliable
  - In military field settings, need to consider impact of research on mission.

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Implications for Nursing Science

- National Guard medical personnel were significantly sleep restricted during a disaster training exercise and this significantly affected their cognitive effectiveness.
- Disaster training exercises are likely to be a conservative estimate of real world disasters.
- Given the connection between fatigue and medical errors, targeted interventions to improve sleep are critical.
- The need to safeguard our service members and the civilians they protect is clear.

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Dissemination

Commanders' briefings: November 2017 and January 2018

Participant briefings of results with implications for science of sleep and sleep hygiene recommendations: November 2017 and March 2018

Western Institute of Nursing Conference April 2018

Manuscripts:

Smart, D., Odom-Maryon, T., James, L., Rowan, S., & Roby, A. (2017). Development of a critical skills assessment for military medical field settings. *POJ Nursing Practice & Research, 1*(4):1-8.

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THANK YOU

QUESTIONS????

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